

# **TALLAHASSEE AREA MINIMUM TEMPERATURE STUDY Monthly Report-May 2002**

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## **Introduction**

This is the sixth monthly report describing minimum temperatures in the Tallahassee area. It is part of a long term joint research project between the National Weather Service in Tallahassee and the Florida State University Department of Meteorology.

## ***May 2002***

This month was slightly warmer and drier than normal. The average minimum temperature at the Tallahassee Regional Airport during May 2002 was 62.3 degrees, compared to the 30 year May average of 61.8 degrees. The airport recorded only 1.75 inches of rain with only four days having measurable amounts. The May normal is 4.95 inches. Much of this precipitation (1.13 inches) occurred on May 18<sup>th</sup>. Twenty observers participated in the study, and their locations are indicated on the map (Figure 1). The observer locations represent a wide spatial distribution across Leon County.

## **1. TALLAHASSEE AREA MAY 2002 REVIEW**

Table 1 gives daily minimum temperatures as well as means and standard deviations for each location in the network. These data can be used to compare any site with the other nineteen. The coolest readings at the airport occurred between May 19th-23rd and especially on the 20th-21st when minimums dropped to the mid 40s. The mildest readings were noted on the 3rd-5th and 11th-12th when minimums remained above 70 degrees. The only significant cold front this month crossed the area on the 18th and early on the 19th dropping 1.60 inches of rain at the airport. In its wake, winds increased as they veered initially to the northwest and then to the northeast, skies cleared, and visibilities became unrestricted. This led to a drop of 21 degrees from the pre-frontal minimum of 67.4 degrees on the 18<sup>th</sup> to a post-frontal 46.6 degrees on the 20<sup>th</sup> with only a slow climb to 51.4 degrees on the 23<sup>rd</sup> attesting to the strength of this cold and dry air mass. Conversely, persistent sultry, onshore winds dominated the warmest periods. May 1st-12th and the 27th-31st all recorded minimums above the monthly average. Each nights' airport observation noted fog, with dense fog, low ceilings, smoke and haze occurring on more than half of these days. This led to greatly reduced radiational cooling and unseasonably warm minimums.

On the coolest days of the month, the range of minimums across the Tallahassee area was 10 to 15 degrees. Conversely, on the mildest nights, the ranges were generally 8 to

11 degrees. As expected during the mid-spring season, and consistent with the previous month, the greatest daily ranges during May were considerably less than those during the four winter months. Likewise the ranges on the coldest and mildest days were not noticeably different. However, all daily ranges remain significant for a small city like Tallahassee.

## 2. MAY 2002 MINIMUM TEMPERATURE EVALUATION

Figure 2 is a station histogram which shows how your site ranks in comparison to the other nineteen sites during May 2002.

Table 2, labeled "Frequency of Extremes", demonstrates another way to view the data. It is more informative than simple raw data or rank histograms, telling how many times (and the percentage of times) that your station ranked as one of the coldest or warmest four sites on a particular day.

### a) Coldest and warmest sites

Four of the five coldest sites during May also were the coldest during the previous months. These are (in order) McCool, Canopy, Binkley, Lundy, and Oak Ridge. Oak Ridge (the sixth coldest in April) replaced Chiles whose equipment was damaged. All five warmest sites this month were the same as those during the previous months. These include (in order) Winsberg, Brogan, Bellenot, FSU and Wakulla. All but Wakulla are located in or near downtown, in areas dominated by artificial surfaces, especially asphalt, as well as the counties tallest buildings. All these factors serve to decrease wind speeds, retard outgoing radiation and enhance the greenhouse effect; thereby moderating nighttime minimums. These data substantiate the significant ranges between the downtown area and the more rural suburbs. The monthly consistency in the spatial distribution of cold and warm sites validates the data presented.

### b) Topography, natural surfaces and soil type

The results continue to show relatively large temperature variations associated with the Tallahassee urban heat island, even during periods of mild weather. As with all previous months, the five coldest sites are located far from downtown in the most rural parts of the county where natural surfaces dominate. Two are in the northwest, two in the south, and one in the southwest quadrants. Topography likely influences the temperature distribution. These coldest sites are all situated west of the Thomasville-Meridian-Monroe roads that divide the county in half, with the western half being relatively hilly and the eastern half relatively flat. Soil type also may factor into the temperature distribution. North of Tennessee Street, the prevailing soil type is clay, while sand predominates to the south. These deep sands are more effective emitters of radiation which translates to lower nighttime minimums, especially when augmented by the absence of surrounding trees and vegetation. This may contribute to the abundance of cold sites across the southern half of Leon County.

### c) Wind speed and direction

The May data continue to validate classical urban heat island studies which indicate that minimum temperatures decrease as you move away from the city center. Perhaps of greater interest is the spatial distribution of cold sites during and after a frontal passage. During a passage and the day after, when speeds from the northwest and north are strongest, locations in the northwest through northeast quadrants, which are not normally cold, rank among the coldest for that day. These include WCTV (310 feet) and Fiorino (85 feet). Both sites are located on north or windward facing slopes and, in two cases, on some of the county's highest elevations. However two days later, when winds typically diminish and radiational cooling dominates, the distribution of coldest sites becomes more evenly distributed (see above) and also includes Venable and Elsnor located in relatively low spots south and east of downtown respectively. The distribution is no longer based largely on wind speed and direction, but more on distance from downtown, the amount of natural surface, topography and soil type.

### d) The Tallahassee Airport (TLH)

During May, the Tallahassee airport was one of the warmest four sites 16 percent of the time, but one of the coldest only 3 percent of the time. Considering the six month study period (December-May), it was one of the warmest sites 22 percent and coldest only 6 percent of the time, with little change from winter to spring. This continues to substantiate that, contrary to popular belief, the airport does not represent a cold valley in area temperatures. Minimum temperature forecasts for Leon County must address this issue.

## Summary

This is the sixth month of collecting Tallahassee area minimum temperature data including all of winter 2001-2002, plus most of the spring 2002 season. During May, daily temperature ranges, ( for cold vs mild nights and under varying synoptic conditions), were comparable with those of April. Although temperature ranges during both of these months were noticeably less than during the winter months, they remain significant for a city this size. Therefore, the notion that the warmer spring season would largely negate these temperature ranges has not been validated. Rather, the data continue to imply that the Tallahassee urban heat island is more complex, and the minimum temperature ranges are significantly more varied, than previously anticipated. Although temperatures generally decrease with distance from downtown, several factors can alter this circular distribution. In particular, the daily spatial distribution of coldest temperatures appears to be related to synoptic factors, including the effect of frontal and post-frontal weather as well as topography, soil and land use type. Future reports will investigate the reasons for these occurrences in more detail.